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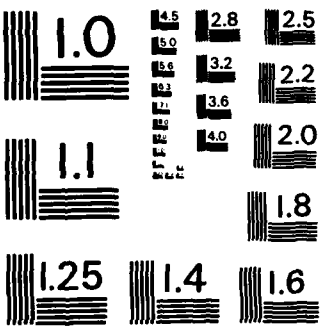

HOSPITALIZATIONS FOR ACCIDENTS AND INJURIES IN THE U. S. NAVY: III. TIME IN ASSIGNMENT AND SENIORITY

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HOSPITALIZATIONS FOR ACCIDENTS AND INJURIES IN THE U.S. NAVY:

III. TIME IN ASSIGNMENT AND SENIORITY

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SUMMARY

Problem

Accidents are the leading cause of death and disability among men under age 35, claiming more lives than all other causes combined. The U.S. Navy has a large majority of personnel within this age group (88%) and, therefore, is especially vulnerable to manpower losses resulting from non-combat injuries. In order to provide more effective accident prevention programs, it is necessary to obtain a better understanding of environmental, occupational, and individual factors and how they may contribute to accidents in the U.S. Navy.

Objective

The objective of this study was to provide more detailed analyses of accidental injury-related hospitalizations as a function of work environment characteristics such as pay grade (seniority), duty status, and place of work in relation to temporal factors, to determine if time spent at a duty station prior to an accident affected an individual's risk of injury and subsequent hospitalization.

Approach

Participants included all male enlisted personnel who had an accident during the three-year period from 1977-1979 that resulted in hospitalization, a Medical Board, a Physical Evaluation Board, or death (N = 5,608). Data were obtained from the medical history and service history files maintained at the Naval Health Research Center. The following classifications were used to further describe the circumstances of individual injuries: (1) external cause of injury, (2) pay grade, (3) work environment (sea or shore), (4) duty status (on-duty, off-duty, status unspecified), and (5) time in assignment prior to injury.

Results

Time in assignment influenced the risk of serious injury for shore-based personnel, who exhibited the greatest number of injuries (requiring hospitalization) during the first few weeks at a new job. The hospitalization rate decreased dramatically following the first month on the job, then gradually declined, and finally levelled off after six months. Even in the more senior pay grades the greatest percentage of accidental injuries, for shore-based assignments, occurred during the first month on the job. Injury rates for sea-based personnel were not affected by temporal factors. Analysis of external cause of accident revealed that off-duty shore-based personnel had significantly elevated risks of hospitalization from athletics, falls, motorcycles, automobiles, and machinery-related accidents compared to off-duty sea-based personnel during the first two months in a new job. Only athletic, falls, and machinery-related accidents significantly contributed to the elevated rates of hospitalization found for on-duty shore personnel when compared to on-duty ship personnel.

Conclusions/Recommendations

This study has shown that risk of injury among Navy enlisted personnel varies as a function of the work environment and the length of time an individual has been assigned to a new duty station. Further analyses are needed to determine if there are specific factors or policies that may explain these differences.

INTRODUCTION

Accidents are the leading cause of death and disability among men under age 35, claiming more lives than all other causes combined [National Safety Council, 1979]. The U.S. Navy has a large majority of personnel within this age group (88%) and, therefore, is especially vulnerable to manpower losses resulting from non-combat injuries. The risks of injury in Navy industrial and operational environments are diverse, especially aboard ship where the effects of injury and accident-related hospitalizations on individual and group performance, and thus on overall operational readiness, are very important.

Archival medical data gathered by the Navy Medical Department has made possible epidemiologic investigations that describe disease and injury occurrence as well as studies of various etiologic and exposure variables. Previous research has reported that accident rates vary with occupation or type of work assignment [Ferguson, McNally and Booth, 1981; Hoiberg, 1980; Melton and Hellman, 1977]. Individual characteristics such as age, education level, length-of-service, pay grade (seniority), and perception of the work environment have also been shown to have a significant impact on overall accident and illness rates [Ferguson, McNally and Booth, 1984; Gunderson, Rahe, Arthur, 1970; Pugh and Gunderson, 1975; Helmkamp and Colcord, 1984]. Two recent studies by Helmkamp and Bone [1985a; 1985b] indicated that the shipboard environment was a major risk factor for accidents and injuries.

While the previous studies by Helmkamp and Bone [1985a; 1985b] focused their analyses on the contributions that duty station assignment, duty status, seniority and external cause of accident may have had on the risk of accidental injury-related hospitalization, this study calculates accidental injury hospitalization rates by pay grade, duty status, and external cause in relation to temporal factors, to determine if time in assignment (time at duty station prior to accident) affects an individual's risk of injury and subsequent hospitalization. This paper is the third in a series of epidemiologic investigations of the principal risks of accidental injury hospitalizations for active duty Navy enlisted personnel during the three-year period 1977-1979.

METHODS

Population data for all male enlisted personnel in nine pay grades (E1 through E9) were compiled from data files obtained from the Navy's Manpower and Personnel Management Information System. The estimate of the annual population at risk for each of the pay grades was based on the average personnel strength for five quarterly reporting periods (December of the previous year, March, June, September, and December) during each calendar year. Recruits undergoing basic training were not included within the E1 pay grade; however, individuals who may have been administratively reduced to E1 for disciplinary infractions were included in the analysis.

Hospitalization and death data were obtained from computer files maintained at the Naval Health Research Center, San Diego. Participants in the study included all male enlisted personnel who had an accident during the three-year period 1977-1979 that resulted in hospitalization, a Medical Board, a Physical Evaluation Board, or death. The term "hospitalization" will be used throughout this report to collectively describe these outcome events. Hospitalizations were considered to be due to an accident if the diagnoses were included in the "Accidents, Poisonings,

and Violence" category (codes 800-900) of the eighth revision of the International Classification of Disease, Adapted for Use in the United States. Self-inflicted, combat, or assault-related injuries were not included. Additional classifications were used to further describe individual injuries: 1) external cause of injury, 2) pay grade, 3) work environment (sea or shore), 4) duty status (on-duty, off-duty, or status unspecified), and 5) time in assignment prior to injury; this latter variable was defined as the period between assignment to a new duty station and hospitalization for an injury.

Accident-related hospitalization rates were computed by taking the three-year annual average number of injuries attributed to the specific time frame (e.g., <1 month, 1 month, 2 months ... 6 months) and dividing by the appropriate average population (formulas and population strengths are provided in the first two reports of this series) [Helmkamp and Bone, 1985a; 1985b]. Ninety-five percent confidence intervals were calculated using the following formula [Lilienfeld and Lilienfeld, 1980]:

$$p \pm 1.96 \sqrt{\frac{(p)(1-p)}{N}}$$

Relative risk levels were then computed as the ratio of these rates; 95% confidence limits for the relative risks were calculated using the following formula [Miettinen, 1976]:

$$exp\ [R\ (1 \pm 1.96/x)]$$

where: $R = \ln$ [relative risk]

$x = \sqrt{X^2}$ the calculated chi-square statistic

RESULTS

The effect of temporal factors on the incidence of accidental injury among Navy enlisted personnel is illustrated in Figure 1, which depicts the rate of hospitalization by time in assignment prior to injury.

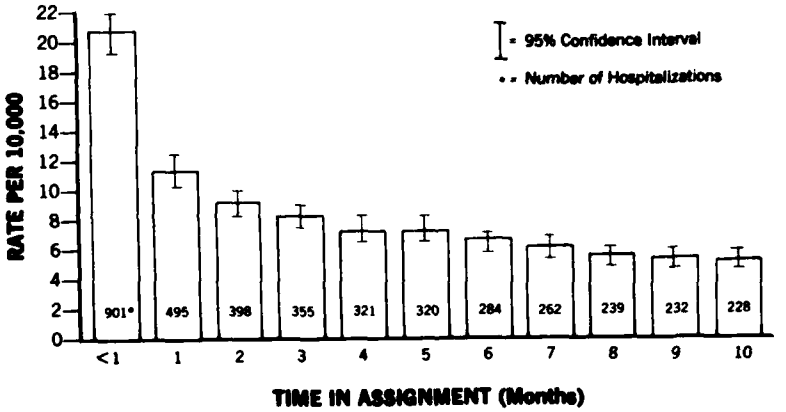

Figure 1. Accidental Injury Hospitalization Rates by Time in Assignment for CY 1977-1979.

Hospitalization rates decreased dramatically following the first four weeks on the job, then gradually declined, and finally levelled out after six months. The highest incidence of injury occurred during the first few weeks (rate = 20.6/10,000), with approximately twenty percent of all injury-related hospitalizations occurring within the first month of a new job assignment. This hospitalization rate was significantly higher than rates observed for the other time intervals. The influence of time in assignment decreased and its effect on accident incidence became much less apparent after personnel had worked at their new jobs for more than two months.

Figure 2 compares the effect time in a new job had on the pattern of injury hospitalization among personnel working at sea and those assigned to shore duty.

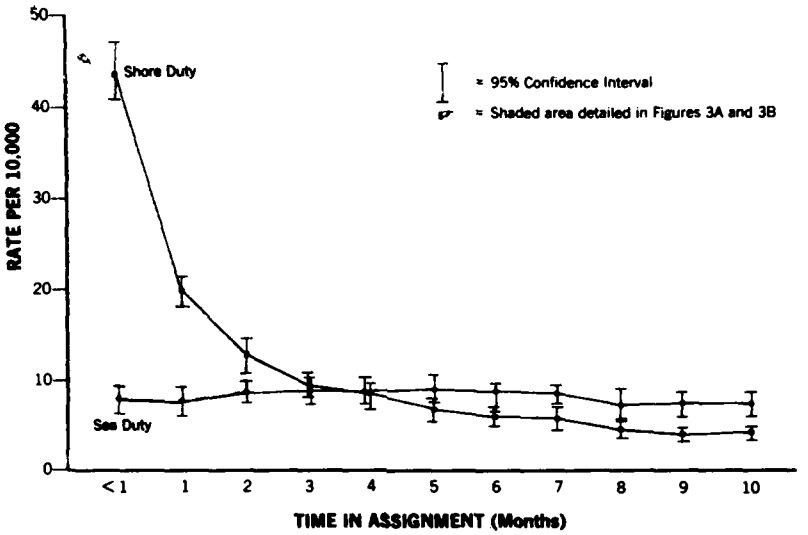

Figure 2. Accidental Injury Hospitalization Rates by Time in Assignment and Sea/Shore Duty for CY 1977-1979.

The hospitalization rates for shore-based personnel declined sharply during the first weeks in a new job and continued to decrease as time in assignment increased. Rates did not vary significantly over time for personnel assigned to sea duty. Rates for personnel in both environments tended to parallel each other after four months; however, shore-based rates remained somewhat lower as time in assignment exceeded six months.

To help explain the sharp differences observed between sea- and shore-based hospitalization rates that occurred during the first two months of a new duty assignment, Figures 3A and 3B provide a breakdown of the shaded area in Figure 2 by duty status and contributing cause of accident. Relative risks [hospitalization rate (shore)/hospitalization rate (sea)] and their 95% confidence intervals are listed only for those causative agents that differed significantly between the two environments.

The data in Figure 3A shows that during the first two months in a new job, accidents due to athletics, falls, motorcycles, automobiles, and machinery were responsible for significantly elevating hospitalization rates among off-duty shore-based personnel compared to off-duty personnel assigned to sea duty. Using relative risk as a comparison of incidence rates, machinery

and automobile-related accidents caused approximately 5 times more hospitalizations per 10,000 for off-duty shore personnel compared to off-duty ship personnel during the first weeks in a new job. For the same time period, off-duty shore-based personnel were 9.0, 6.1, and 4.0 times as likely to be hospitalized for an injury caused by a motorcycle, an athletic, or a fall-related accident, respectively, than off-duty sea-based personnel. The differences in injury risk lessened, but still remained statistically significant, for each of the above external causes (except motorcycle accidents during the second month) throughout the first 2 months in a new job. After two months, the risk of injury to off-duty personnel working within shore or shipboard environments were the same.

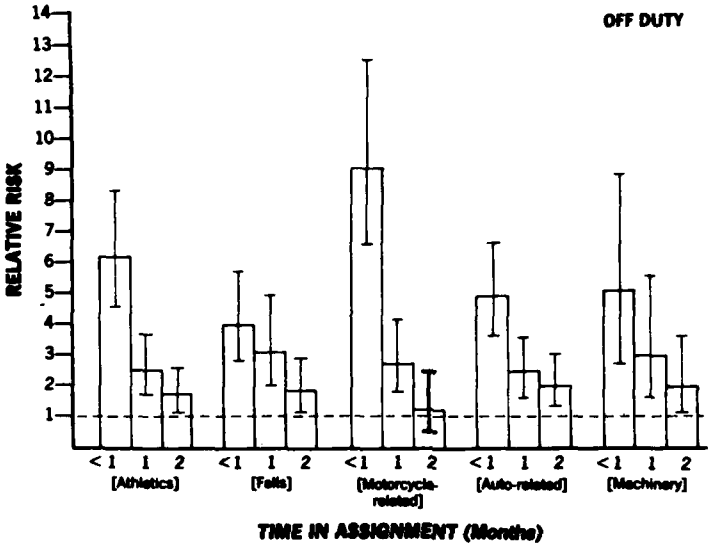

Figure 3A.Relative Risk Comparisons for Selected External Causes of Hospitalization Among Off-duty Shore- and Sea-based Personnel During First Two Months in New Duty Assignment for CY 1977-1979.

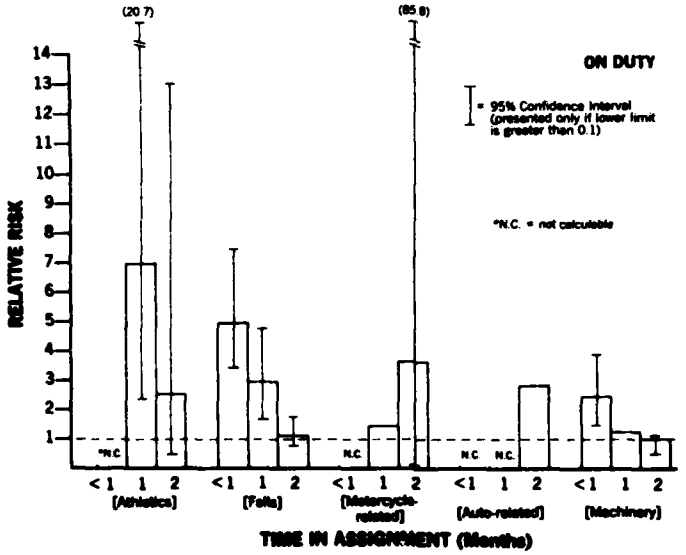

Figure 3B. Relative Risk Comparisons for Selected External Causes of Hospitalization Among On-duty Shore- and Sea-based Personnel During First Two Months in a New Duty Assignment for CY 1977-1979.

The data in Figure 3B depicts the relative risk among on-duty personnel for the same external causes of hospitalization shown in Figure 3A. Two of the causes (athletics and automobiles) had time periods during which no hospitalizations were recorded for on-duty sea-based personnel; therefore, relative risks could not be calculated (labeled N.C. in figure). Fall and machinery-related accidents contributed to significant levels of risk (4.8 and 2.5 respectively) for on-duty shore-based personnel when compared to sea-based personnel during the first weeks in a new job. After working four weeks in the same job, the risk of falls and athletic injuries were significantly elevated for shore personnel; following this time period, the risk of injury to on-duty personnel due to specific causes was equivalent between the two environments.

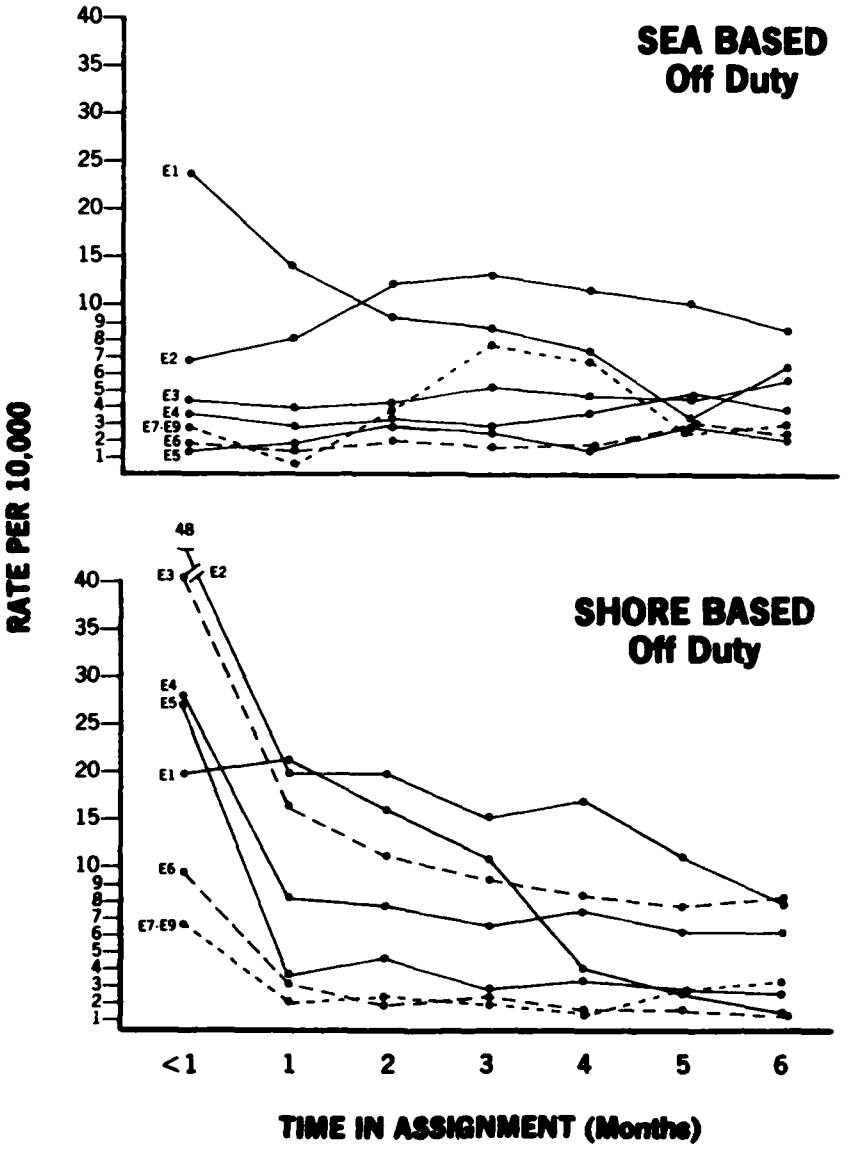

Figure 4. Accidental Injury Hospitalization Rates Among Off Duty Shore- and Sea-based Personnel by Pay Grade and Time in Assignment for CY 1799.

The data in Figures 4 and 5 illustrate the influence pay grade, work environment, duty status and time in assignment had on the incidence of accidental injury hospitalization. The effects of pay grade agree with findings in previous studies [Ferguson et al, 1981; Helmkamp and Bone, 1985b] where an inverse relationship was observed between risk of injury and seniority, with personnel in lower pay grades experiencing higher injury rates. Trend lines in the two lower panels (of Figures 4 and 5) also indicate that the relative time an individual had been in an assignment played a major role in injury risk among shore-based personnel. This effect is much more pronounced for personnel who were in an off-duty status, especially during the first few weeks at a new job, where middle grade level personnel (E2-E5) exhibited hospitalization rates that were

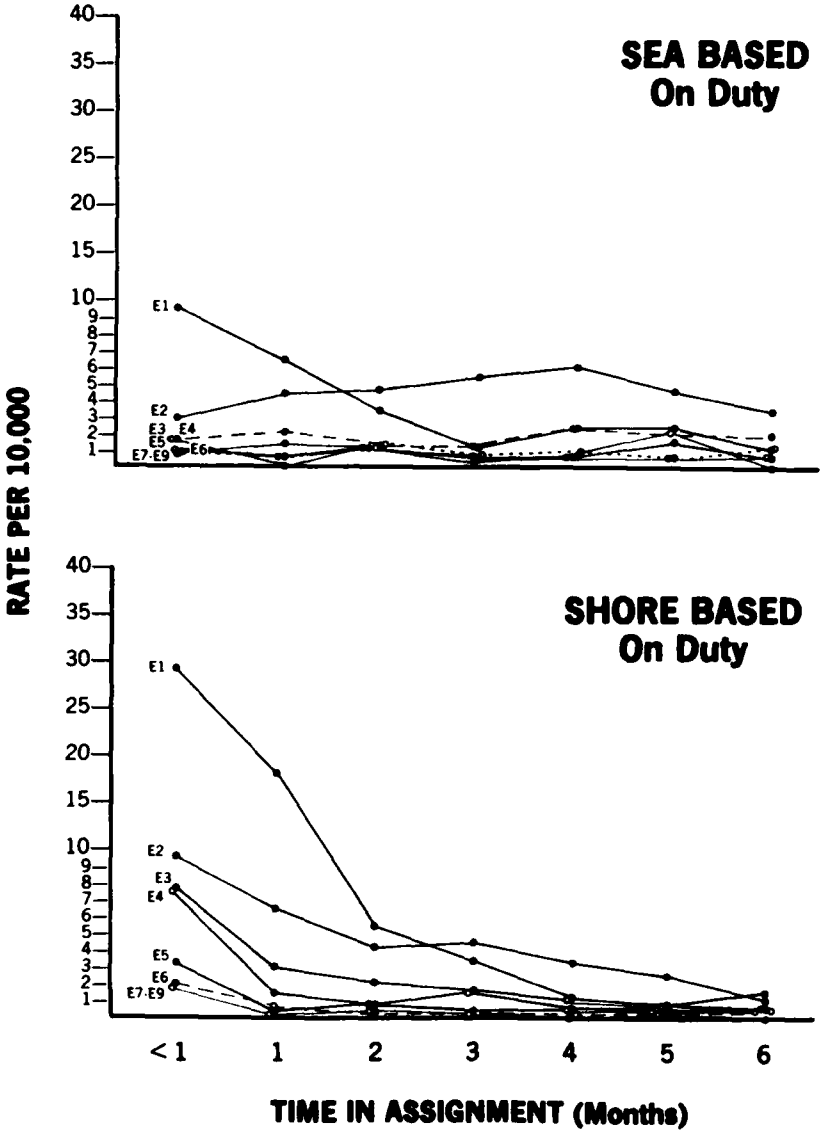

Figure 5. Accidental Injury Hospitalization Rates Among On Duty Shore- and Sea-based Personnel by Pay Grade and Time in Assignment for CY 1977-1979

about four times higher than those experienced by more senior personnel (E6-E9). Rates decreased sharply after the first few weeks and then gradually leveled off after five months. For on-duty shore-based personnel (Figure 5), rates leveled off among the senior pay grades (E4-E9) after two months; the rates among Els, E2s, and E3s continued to gradually decline through five months on the job.

Except for El personnel, temporal factors did not appear to significantly effect the incidence of injury among sea-based personnel, as shown in the upper panels of Figures 4 and 5. There was a slight increase in injury incidence among the other pay grades following the first month at a new job. This increase was somewhat greater for off-duty personnel especially in the E2 and E7-E9 pay grades.

The external cause of an accident by pay grade and time in assignment prior to injury was analyzed for the entire Navy to determine if risk varied as the work environment became more familiar. Falls and athletic-related accidents were the leading causes of hospitalization among E-1 personnel, while motorcycle, automobile, and athletic-related accidents were the leading causes of injury among the other pay grades during the first month in a new work assignment. After two or more months on the job, automobile and fall-related injuries occurred most frequently for E-1 personnel. The leading causes remained the same for the other pay grades.

DISCUSSION

The highest incidence of accidental injury hospitalization occurred within the first month of reporting to a new shore-based duty station and then decreased dramatically, indicating that risks of injury vary among Navy enlisted personnel as a function of time spent at a new job. Risk of injury also varied by the type of work environment to which a person was assigned, the duty status of that individual, and their seniority or experience level (as measured by pay grade).

Our findings agree with those of a U.S. Bureau of Labor report [National Safety Council, 1979] citing North Carolina and Iowa data which stated that workers are most likely to suffer an occupational injury or illness during their first month on the job. This trend decreased only slightly with increasing seniority.

Figure 2 revealed that although temporal factors influenced the risk of injury for shore personnel, these factors did not effect the risk for those at sea. Athletic-, automobile- and motorcycle-related accidents, which together contributed to the increased rate observed for off-duty personnel within the first two months on a new job, can be dismissed from the work environment comparisons since personnel serving aboard ship have relatively little exposure to those particular risks. The potential to experience an on-duty machinery or fall-related accident, however, should be similar in both environments. One explanation of why time in a job may exert a greater influence on the risk of injury for personnel on shore assignments but not for those on sea duty might be that training procedures may be different between the two environments. During his first one to two months in a new job, a man aboard ship might receive indoctrination in routine evolutions and safety procedures common to shipboard duty and his new job assignment. On the other hand, a man assigned to shore duty may be expected to perform his job immediately without benefit of a familiarization period or specific training concerning hazards inherent to that

work environment. The worker may not receive the safety information he needs--even on jobs involving dangerous equipment where training is clearly essential.

Since the external causes of an accident-related hospitalization did not change significantly over time for the entire Navy, it would appear that the risks inherent in the work environment remain static with only the susceptibility of the personnel changing over time. Presumably, when the environment is unfamiliar, a newly assigned person may be involved in a greater number of accidents.

An alternate explanation for our results may be inferred from studies reporting that transitory life events and the resultant changes they impose are an important factor in accident etiology [Levine, Lee, McHugh, et al 1975; Rahe, Floistad, Bergan, et al 1974; Selzer and Vinokar, 1974]. These studies suggest that recent life events (e.g., birth of a child, divorce, death of a friend or relative, change of job, financial change, etc.) which bring about a significant change in an individual's ongoing life pattern may cause psychological turmoil that can exacerbate the risk of accident or illness. Assignment to a new job could be considered to be among those personal life change events which cause stress and thereby contribute to an increased incidence of hospitalization. Although one would expect the stress and psychological effect resulting from a job change to be equivalent for both ship and shore environments, sea duty has been considered more stressful than shore duty [Gunderson, 1976]. However, there is a decreased opportunity for motor vehicle use and athletic participation onboard ship which lessens the risk of serious injury for shipboard personnel compared to those personnel assigned to shore-duty.

Most probably, the unfamiliar work environment, the life change event, and inadequate indoctrination periods contributed to the high hospitalization rates observed for shore-based personnel during the first month in a new job assignment. Further investigation into the relative contribution of each is warranted.

CONCLUSIONS

The results of this study have shown that risk of injury among Navy enlisted personnel varies as a function of their work environment and the length of time an individual has been assigned to a new shore-based duty station. Collectively, results from the three studies in this series strongly support the theory that the occupational environment is a major risk factor in hospitalizations resulting from accidents and injuries. Analysis of temporal, individual, occupational, and causal factors has helped contribute to a better understanding of accident risk among Navy personnel.

REFERENCES

Ferguson, J.C.,McNally, M.S. and Booth, R.F. Accidental injuries among Naval personnel by occupation, duty status, and pay grade. Report No. 81-7, Naval Health Research Center, San Diego, California, 1981.

Ferguson, J.C., NcNally, M.S. and Booth, R.F. Individual characteristics as predictors of accidental injuries in Naval personnel. Accid. Anal. and Prev. 16(1):55-61, 1984.

Gunderson, E.K.E. Health and adjustment of men at sea. In: The social psychology of military service, Goldman, N.C. and Segal, D.R. (eds). Sage Publications, Beverly Hills, California, 1976.

Gunderson, E.K.E., Rahe, R.H. and Arthur, R.J. The epidemiology of illness in Naval environments, II. Demographic, social background, and occupational factors. Military Medicine, 453-548, June 1970.

Helmkamp, J.C. and Bone, C.M. Hospitalizations for accidents and injuries in the U.S. Navy I. Duty station assignment and duty status. Report No. 85-5, Naval Health Research Center, San Diego, California, 1985a.

Helmkamp, J.C. and Bone, C.M. Hospitalizations for accidents and injuries in the U.S. Navy II. External cause of accident, duty station assignment, and level of seniority. Report No. 85-8, Naval Health Research Center, San Diego, California, 1985b.

Helmkamp, J.C. and Colcord, C.L. Hospitalization rates among selected Navy enlisted occupations by age, education and pay grade. Report No. 84-34, Naval Health Research Center, San Diego, California, 1984.

Hoiberg, A. Sex and occupational differences in hospitalization rates among Navy enlisted personnel. JOM, 22: 685-690, 1980.

Levine, J.B., Lee, J.O., McHugh, W.M. and Rahe, R.H. Recent life changes and accidents aboard an attack carrier. Report No. 75-83, Naval Health Research Center, San Diego, California, 1975.

Lilienfeld, A.M. and Lilienfeld, D.E. Foundations of Epidemiology. Second Edition, Oxford University Press, New York, 1980.

Melton, L.J. and Hellman, L.P. Causes of hospitalization of active duty personnel. U.S. Navy Med, 68:18-20, 1977.

Miettinen, O. Estimability and estimation in case-referrent studies. Amer J Epid, 103:226-235, 1976.

National Safety Council. 1979 Accident facts. Chicago, National Safety Council, 1979.

Pugh, W.M. and Gunderson, E.K.E. Individual and situational predictors of illness. Report No. 75-20, Naval Health Research Center, San Diego, California, 1975.

Rahe, R.H., Floistad, I., Bergan, T., Ringdal, R., Gerhardt, R., Gunderson, E.K.E. and Arthur, R.J. A model for life changes and illness research, Cross-cultural data from the Norwegian Navy. Arch. Gen Psychiatry, 31:172-177, 1974.

Selzer, M.W. and Vinokur, A. Life Events, Subjective Stress, and Traffic Accidents. Am J Psychiatry, 131(8):903-906, 1974.

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The incidence of accidental injury hospitalization among Navy enlisted men during the period 1977-1979 was analyzed by pay grade and external cause of accident to determine if time in assignment affected an individual's risk of injury and subsequent hospitalization. The highest incidence of injury among shore-based personnel occurred during the first few weeks at a new duty station, then decreased sharply, eventually levelling off after several months. The rates of hospitalization among senior personnel, during the first month at a new duty assignment, were greater than the rates occurring after this

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time interval for junior personnel. The leading external causes of injury (motorcycle, automobiles, and athletics) did not change appreciably over time in the senior pay grades, suggesting that the protective effects associated with seniority and experience may be largely nul'.fied by the lack of familiarity of personnel with their new work environment and that risks inherent in this environment remain static. When comparing shore and sea environments, time was shown to influence the risk of injury for shore-based but not for sea-based personnel. Analysis of external cause of accident revealed that shore-based personnel had significantly elevated risks of hospitalization from athletics, falls, motorcycles, and machinery-related accidents during the first few weeks in a new job compared to sea-based personnel. After one month, the risks of injury were similar in both groups.

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